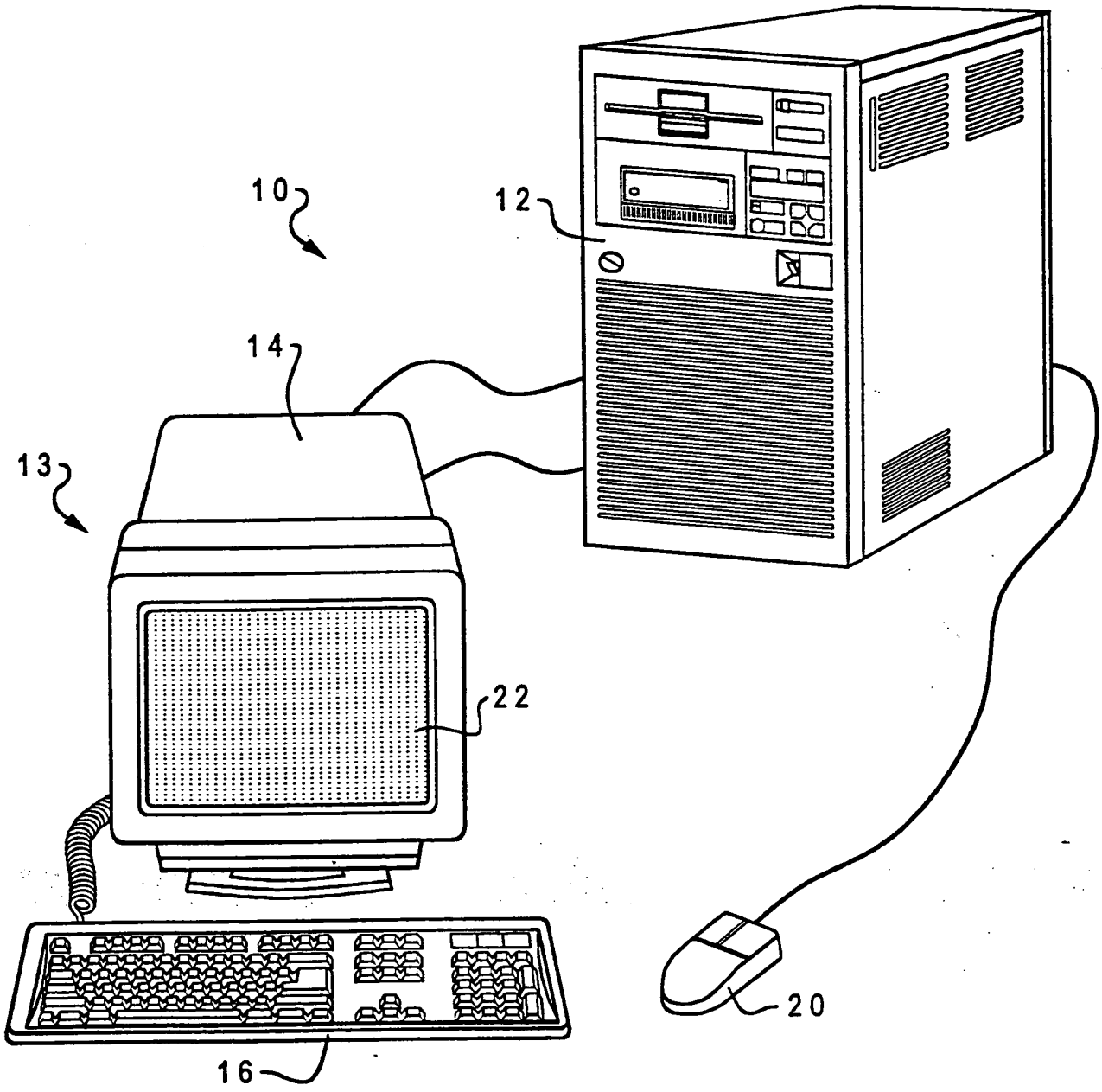


Fig. 1

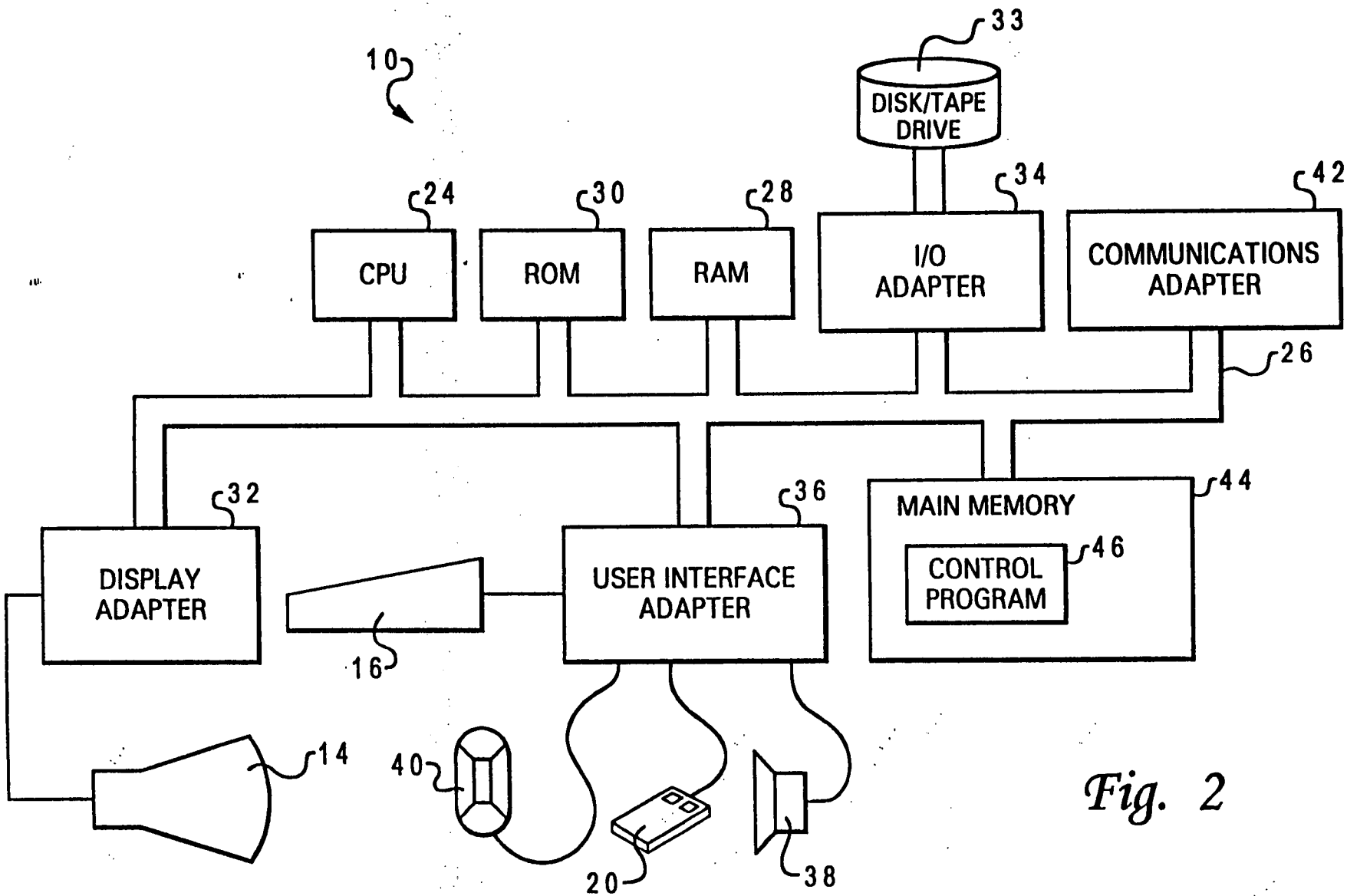


Fig. 2

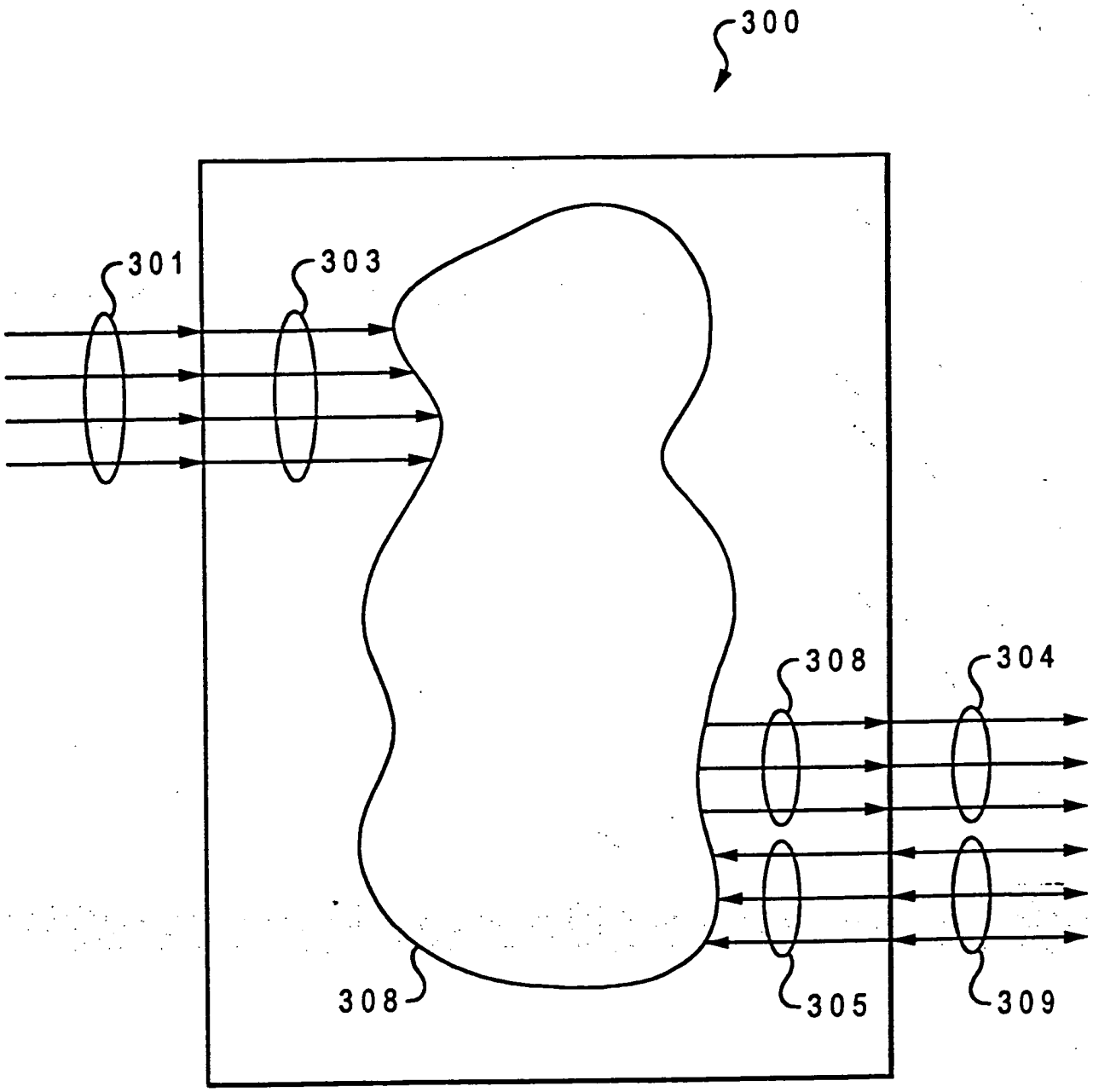


Fig. 3A

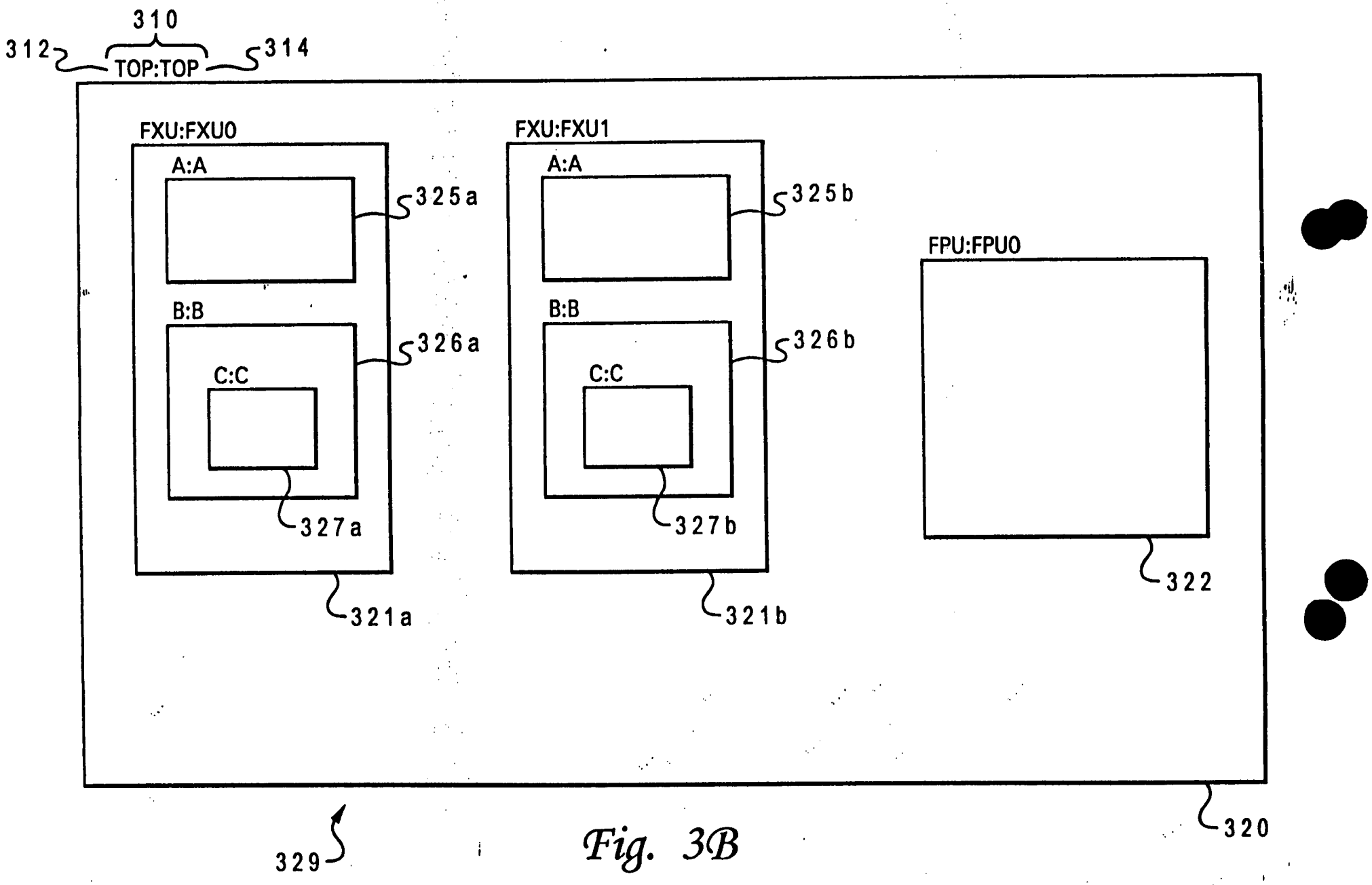

310
312
TOP:TOP
314
FXU:FXU0
A:A
325a
B:B
326a
C:C
327a
321a
FXU:FXU1
A:A
325b
B:B
326b
C:C
327b
321b
FPU:FPU0
322
320
329

Fig. 3B

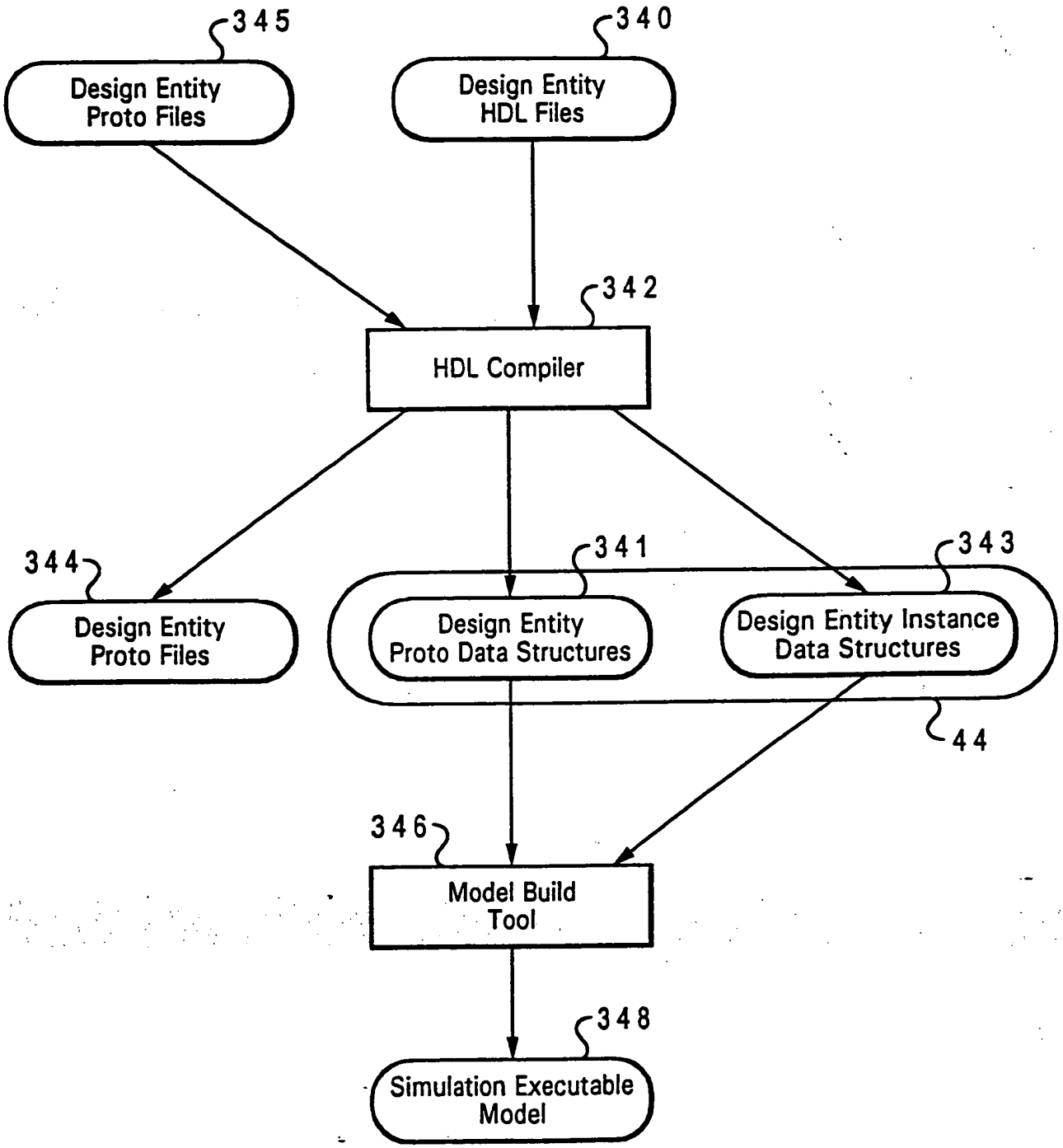

345
Design Entity
Proto Files
340
Design Entity
HDL Files
342
HDL Compiler
344
Design Entity
Proto Files
341
Design Entity
Proto Data Structures
343
Design Entity Instance
Data Structures
44
346
Model Build
Tool
348
Simulation Executable
Model

Fig. 3C

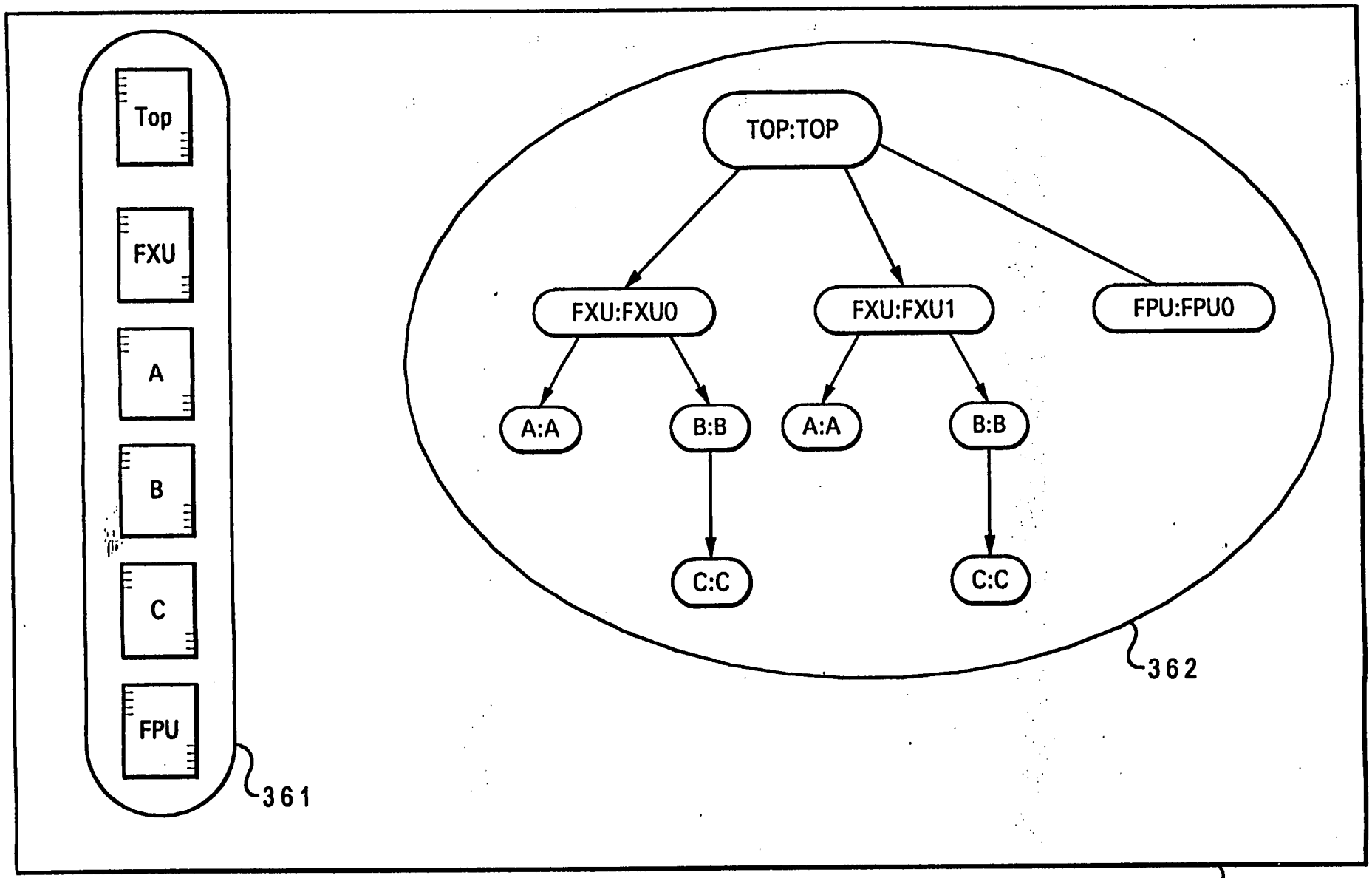

Top
FXU
A
B
C
FPU
361
TOP:TOP
FXU:FXU0
FXU:FXU1
FPU:FPU0
A:A
B:B
A:A
B:B
C:C
C:C
362
44

Fig. 3D

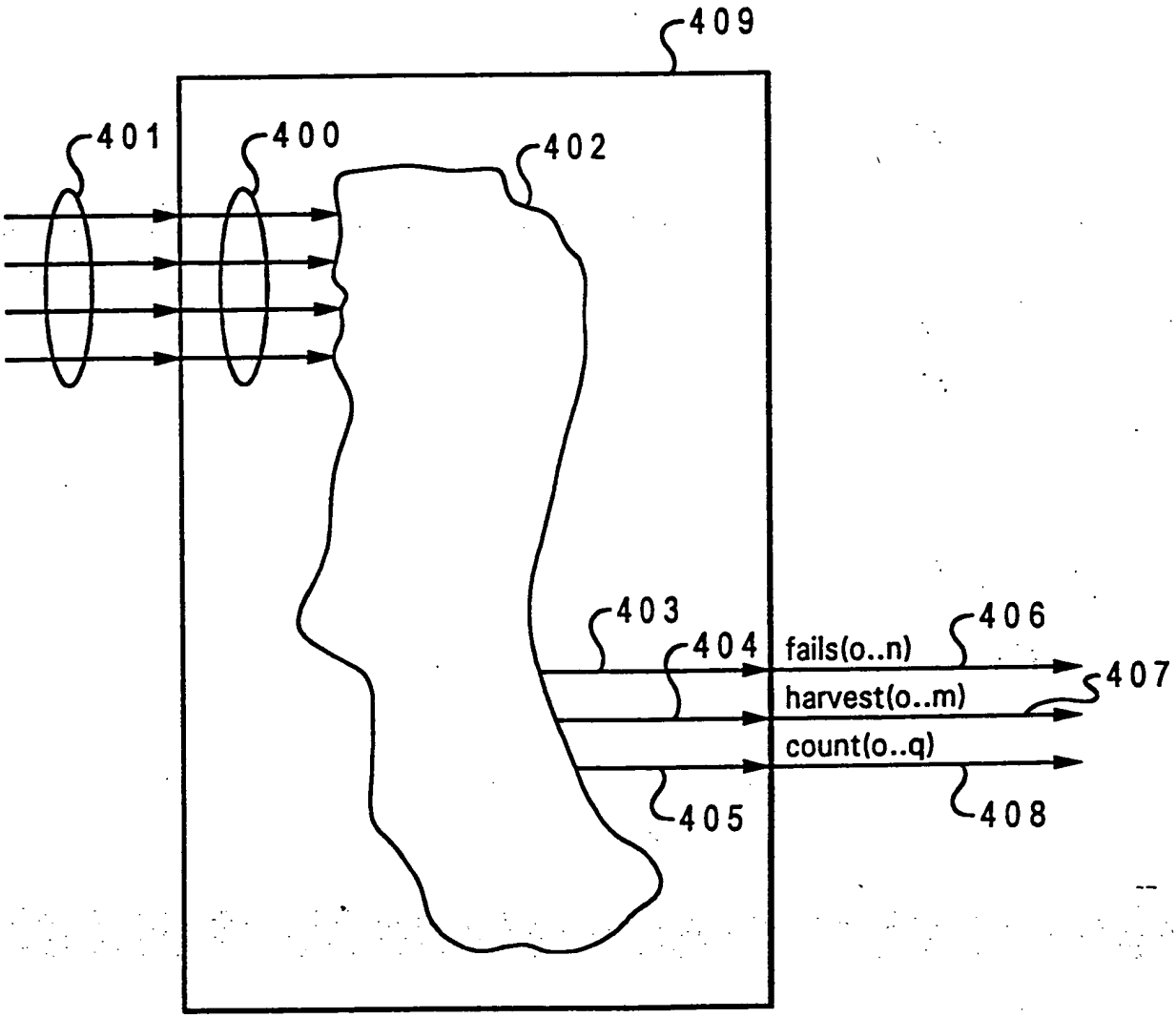

409
401
400
402
403
404
406
fails(o..n)
407
harvest(o..m)
count(o..q)
405
408

Fig. 4A

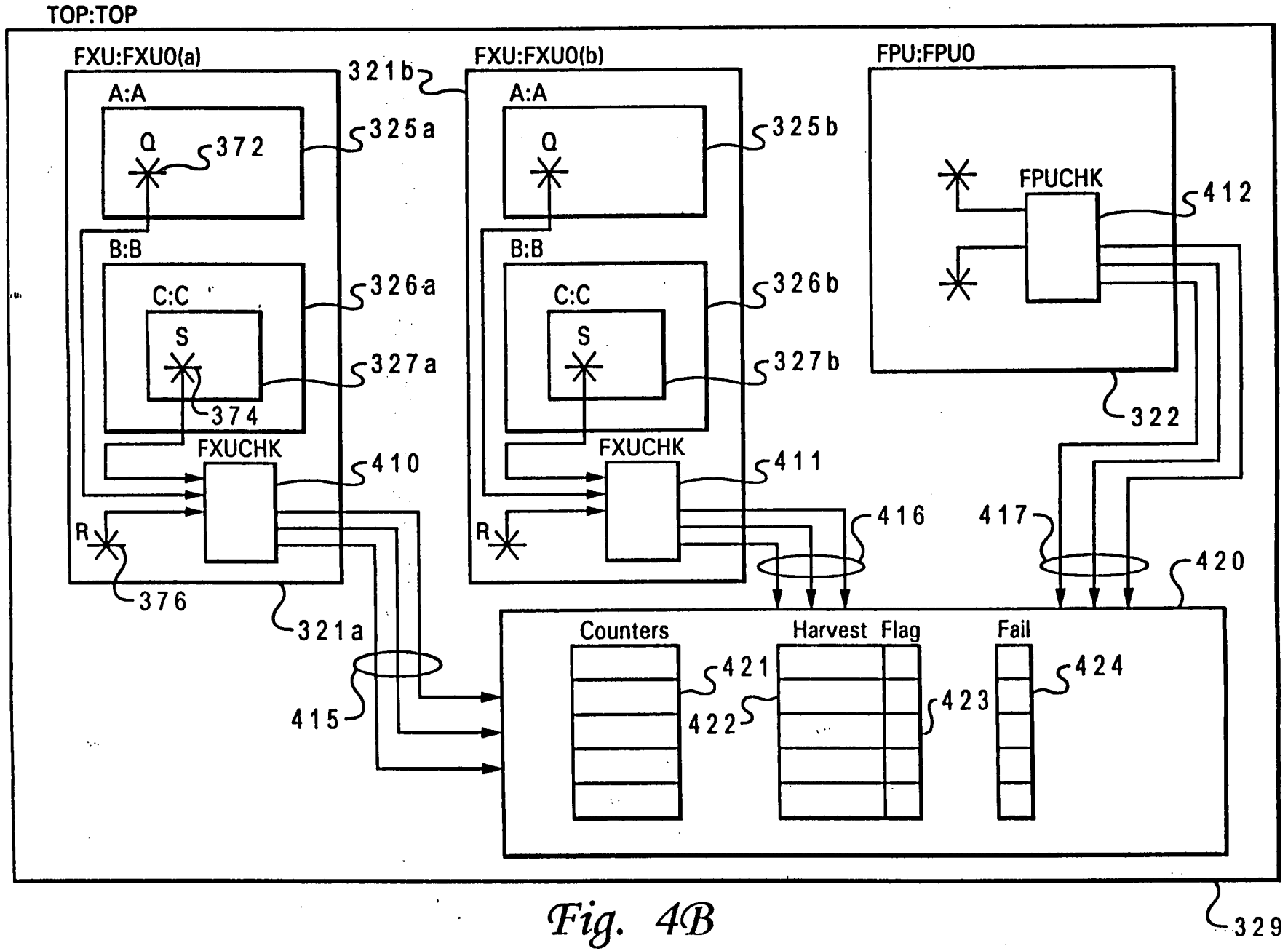

TOP:TOP
FXU:FXU0(a)
A:A
Q
372
B:B
C:C
S
374
FXUCHK
R
376
321a
321b
325a
326a
327a
410
FXU:FXU0(b)
A:A
Q
B:B
C:C
S
FXUCHK
R
325b
326b
327b
411
416
FPU:FPU0
FPUCHK
412
322
417
420
415
Counters
421
422
Harvest Flag
423
Fail
424
329

Fig. 4B

```
ENTITY FXUCHK IS

    PORT(   S_IN        :    IN std_ulogic:
            Q_IN        :    IN std_ulogic:
            R_IN        :    IN std_ulogic:
            clock       :    IN std_ulogic:
            fails       :    OUT std_ulogic_vector(0 to 1);
            counts      :    OUT std_ulogic_vector(0 to 2);
            harvests    :    OUT std_ulogic_vector(0 to 1);
        );

--!! BEGIN
--!! Design Entity: FXU;

--!! Inputs
--!! S_IN        =>    B.C.S;
--!! Q_IN        =>    A.Q;
--!! R_IN        =>    R;
--!! CLOCK       =>    clock;
--!! End Inputs

--!! Fail Outputs;
--!! 0 : "Fail message for failure event 0";
--!! 1 : "Fail message for failure event 1";
--!! End Fail Outputs;

--!! Count Outputs;
--!! 0 : <event0> clock;
--!! 1 : <event1> clock;
--!! 2 : <event2> clock;
--!! End Count Outputs;

--!! Harvest Outputs;
--!! 0 : "Message for harvest event 0";
--!! 1 : "Message for harvest event 1";
--!! End Harvest Outputs;

--!! End;

ARCHITECTURE example of FXUCHK IS

BEGIN

    ... HDL code for entity body section ...

END;
```

450 452 453 454 455 456 457 451 458 440

Fig. 4C

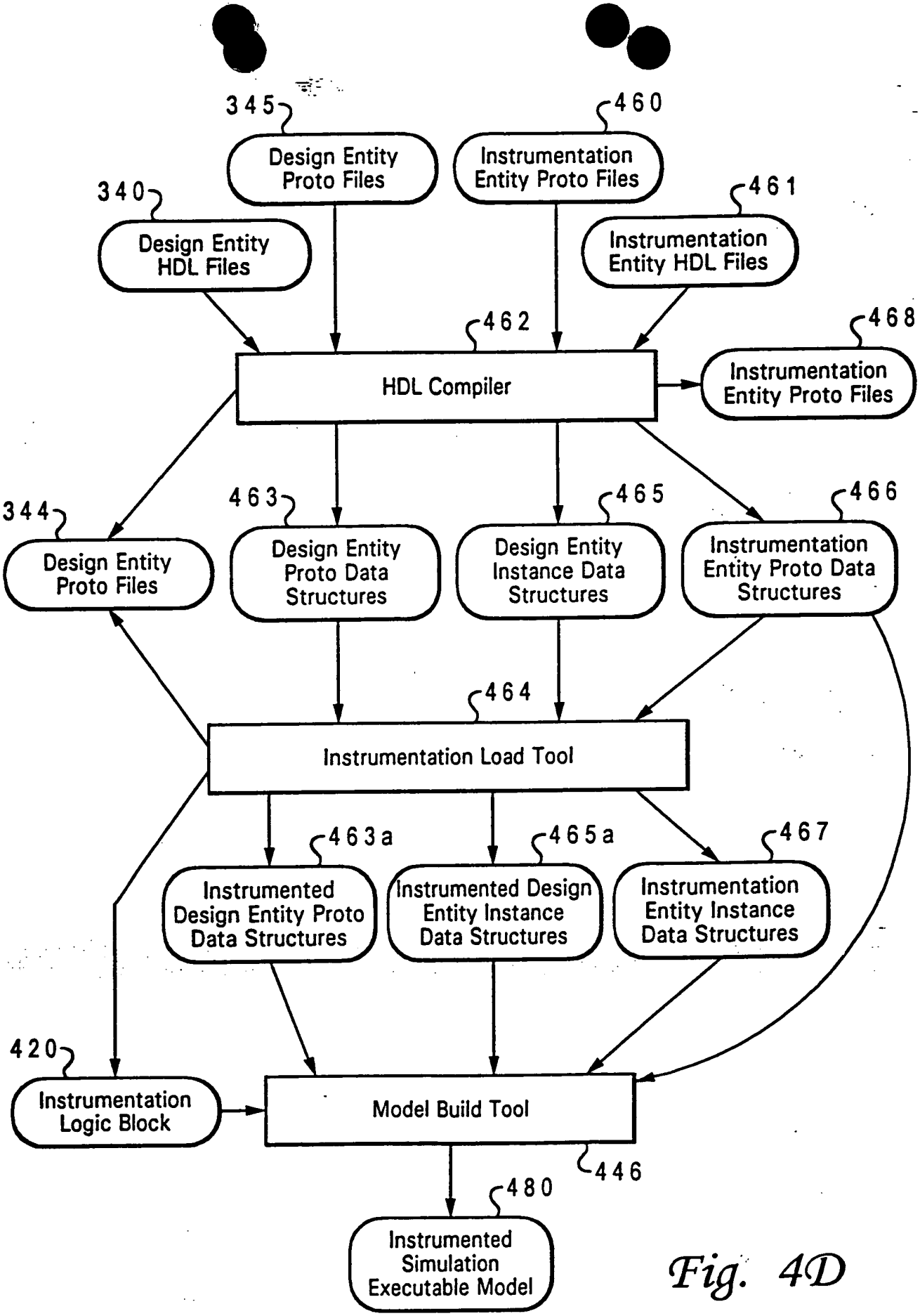

345
Design Entity Proto Files
460
Instrumentation Entity Proto Files
340
Design Entity HDL Files
461
Instrumentation Entity HDL Files
462
HDL Compiler
468
Instrumentation Entity Proto Files
344
Design Entity Proto Files
463
Design Entity Proto Data Structures
465
Design Entity Instance Data Structures
466
Instrumentation Entity Proto Data Structures
464
Instrumentation Load Tool
463a
Instrumented Design Entity Proto Data Structures
465a
Instrumented Design Entity Instance Data Structures
467
Instrumentation Entity Instance Data Structures
420
Instrumentation Logic Block
Model Build Tool
446
480
Instrumented Simulation Executable Model

Fig. 4D

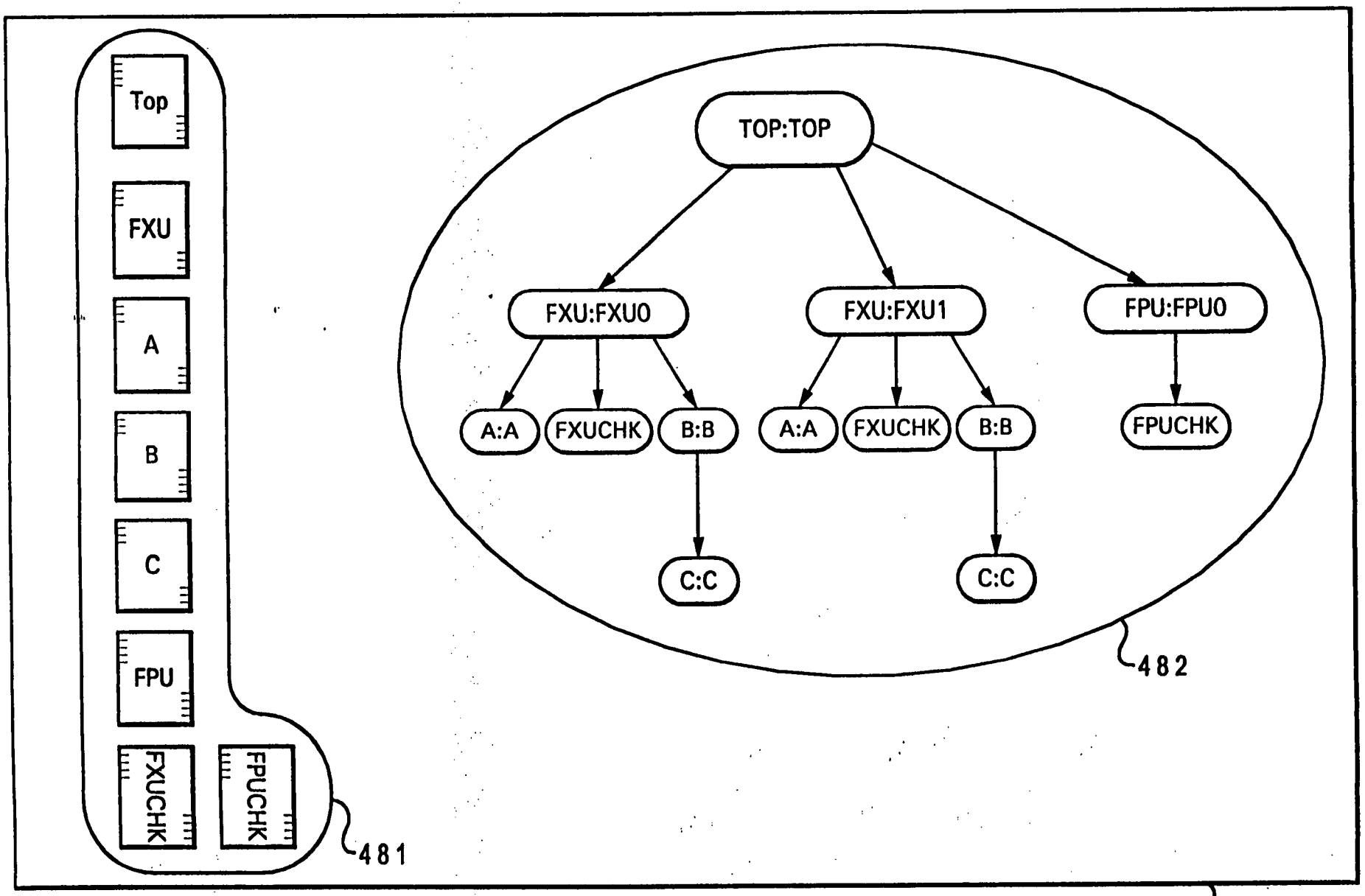


Fig. 4E

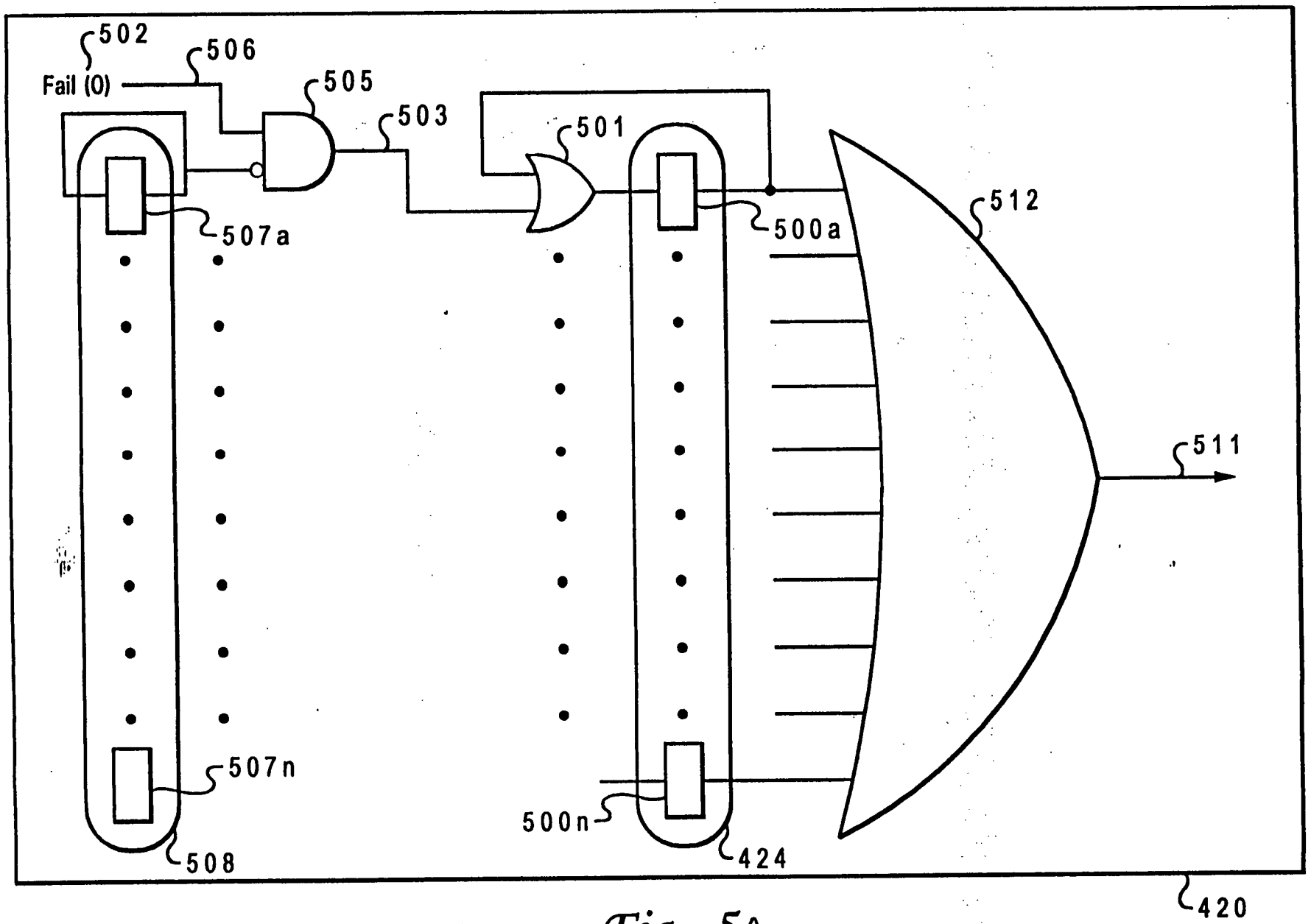

502
506
Fail (0)
505
503
501
507a
500a
512
511
507n
500n
508
424
420

Fig. 5A

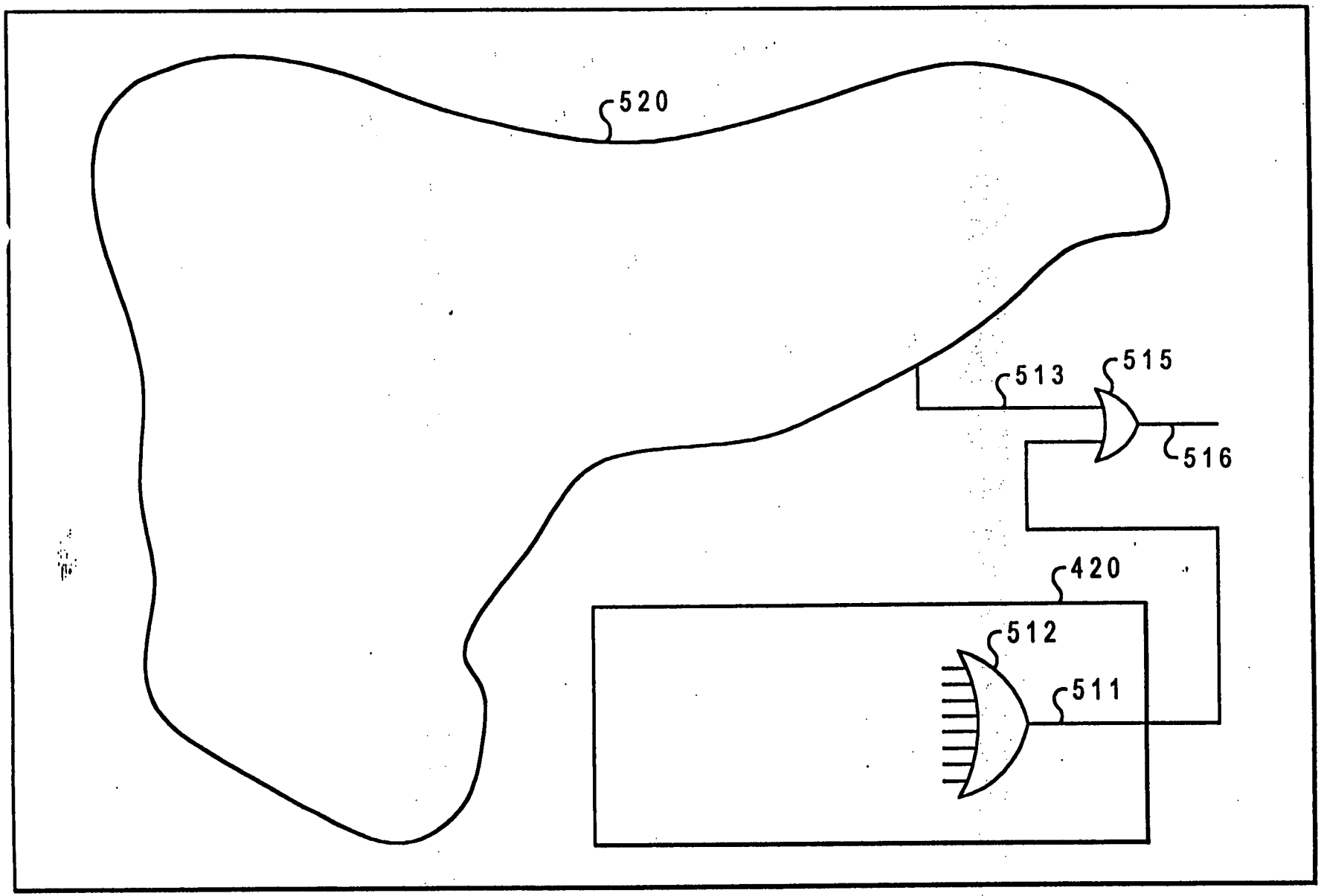


Fig. 5B

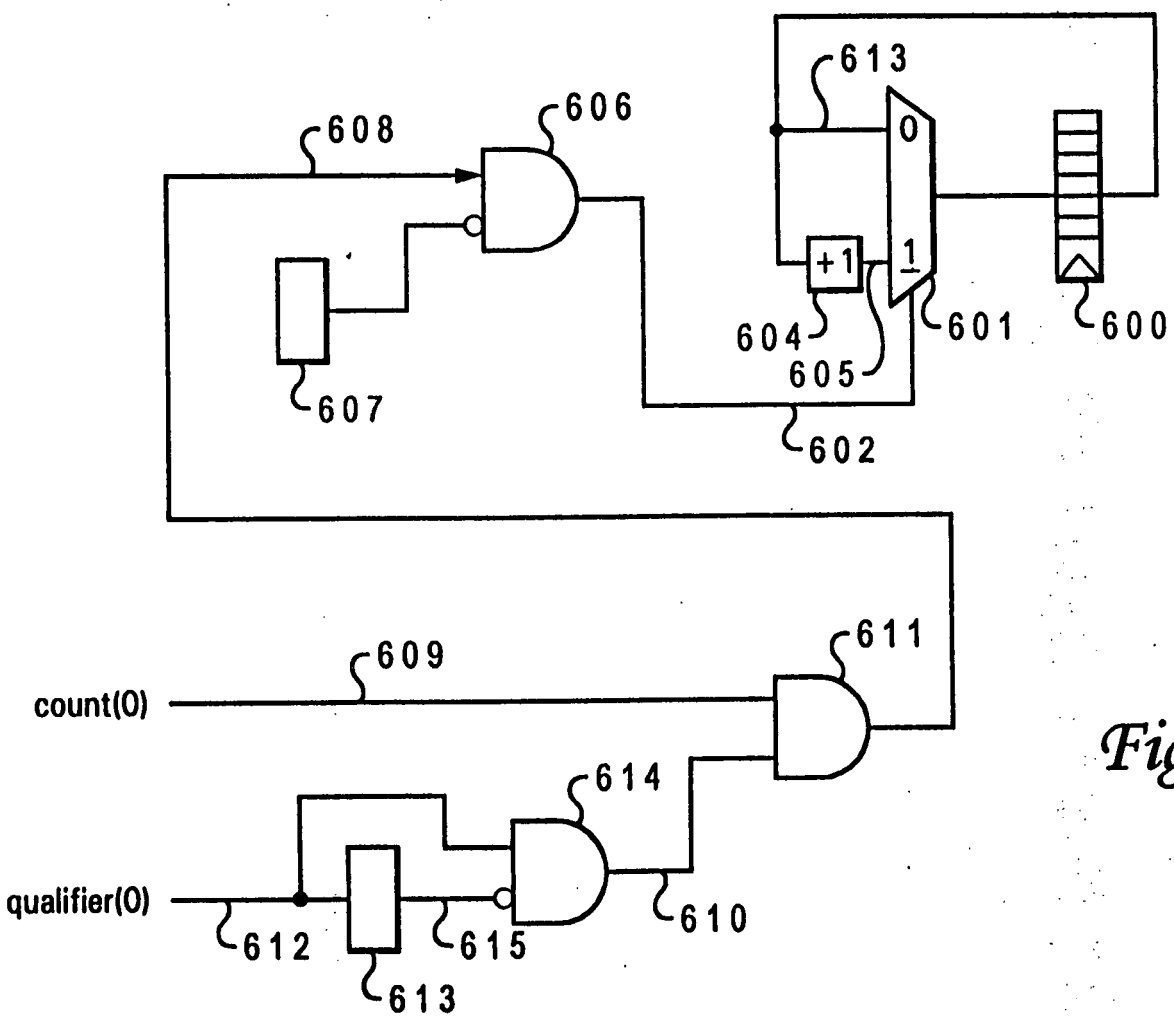


Fig. 6A

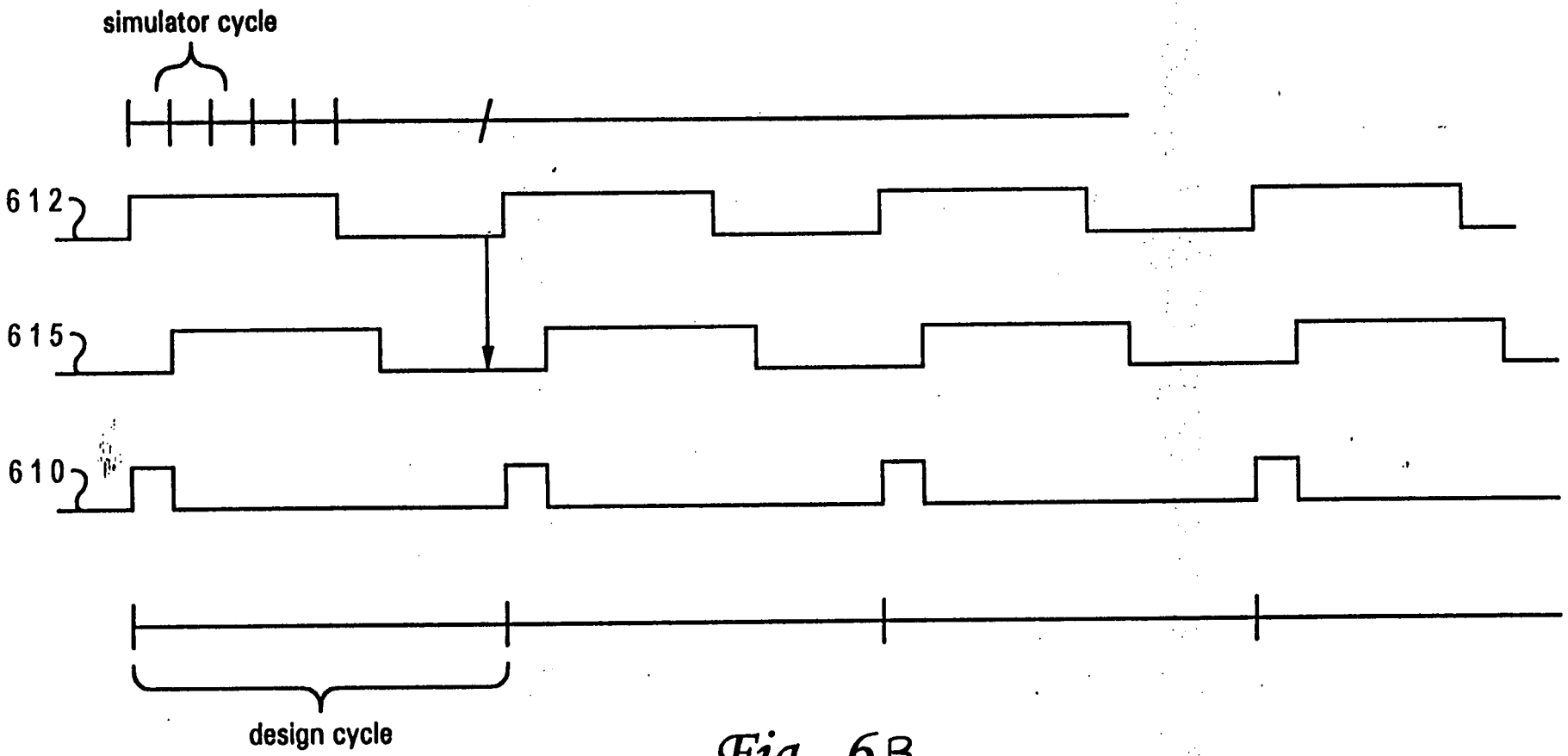


Fig. 6B

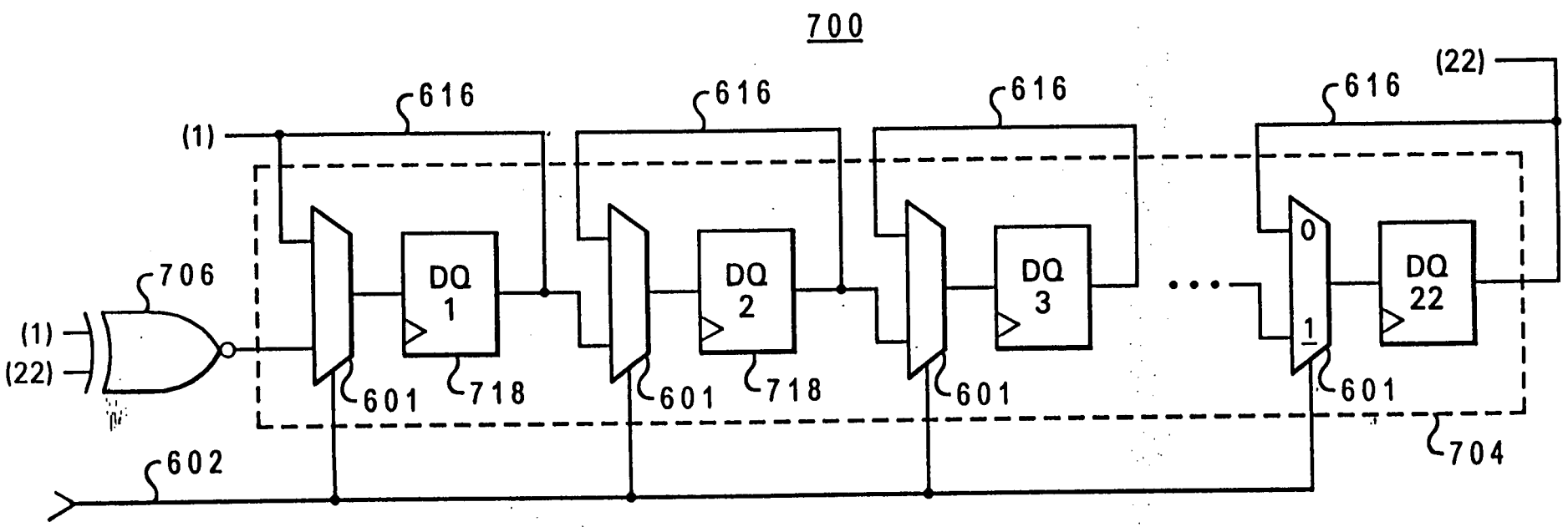


Fig. 7

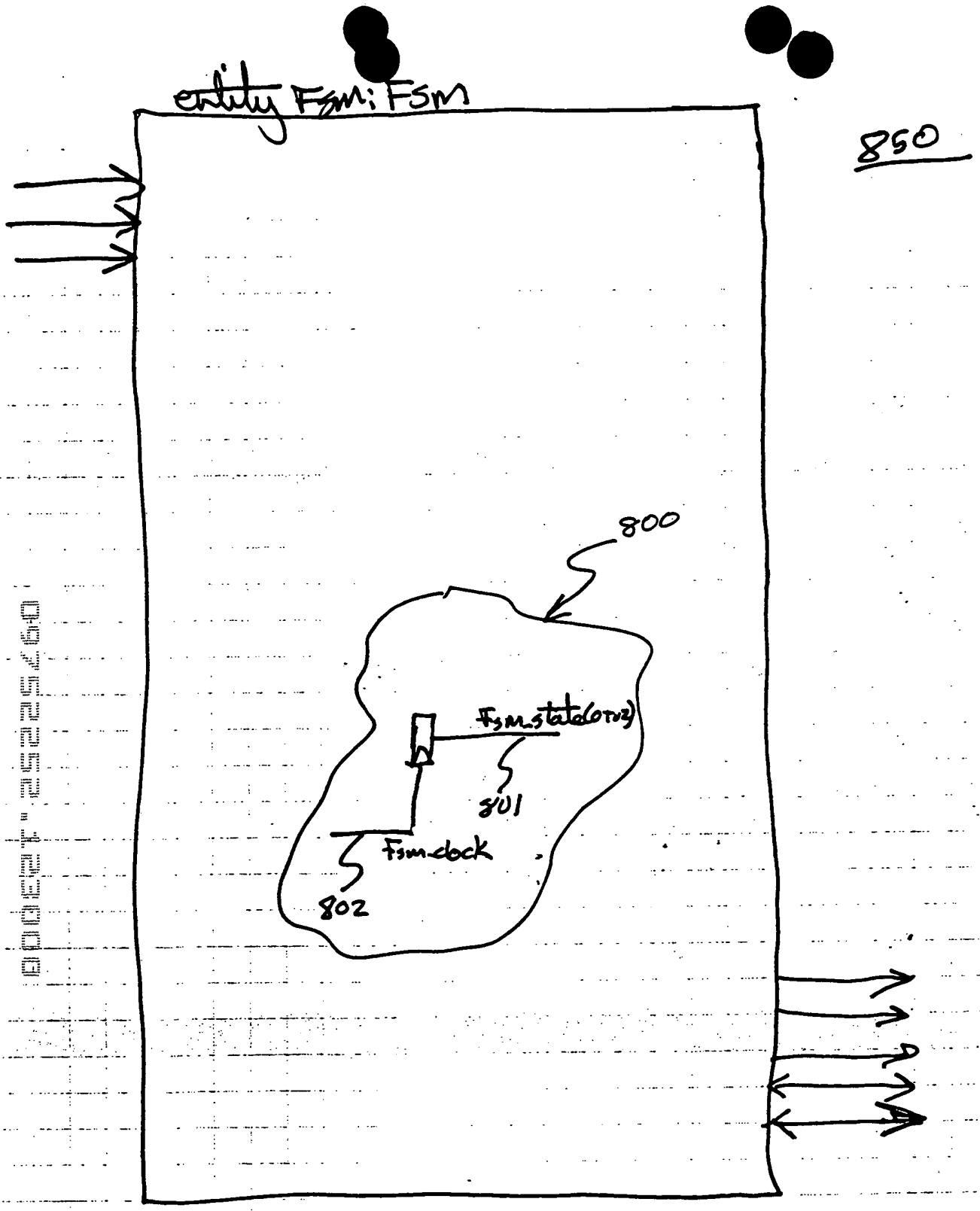


FIG. 8A
(Prior Art)

```
entity Fsm IS
  PORT(
        .... ports for entity Fsm .....
  );

ARCHITECTURE Fsm of Fsm IS

BEGIN

        .... HDL code For Fsm and rest of the entity...

        fsm_state(0 to 2) <= ... signal 801 ....

853 {   --!! Embedded Fsm : exampleFsm;
859 {   --!! clock         : (Fsm_clock);
854 {   --!! state_vector  : (Fsm_state(0 to 2));
855 {   --!! states        : (s0,s1,s2,s3,s4);
856 {   --!! state_encoding: ('000','001','010','011','100');
857 {   --!! arcs          : (s0=>s0, s0=>s1, s0=>s2,
        --!!                 s1=>s2, s1=>s3, s2=>s2,
        --!!                 s2=>s3, s3=>s4, s4=>s0);
858 {   --!! end Fsm;

END;
```

852

856

FIG. 8B

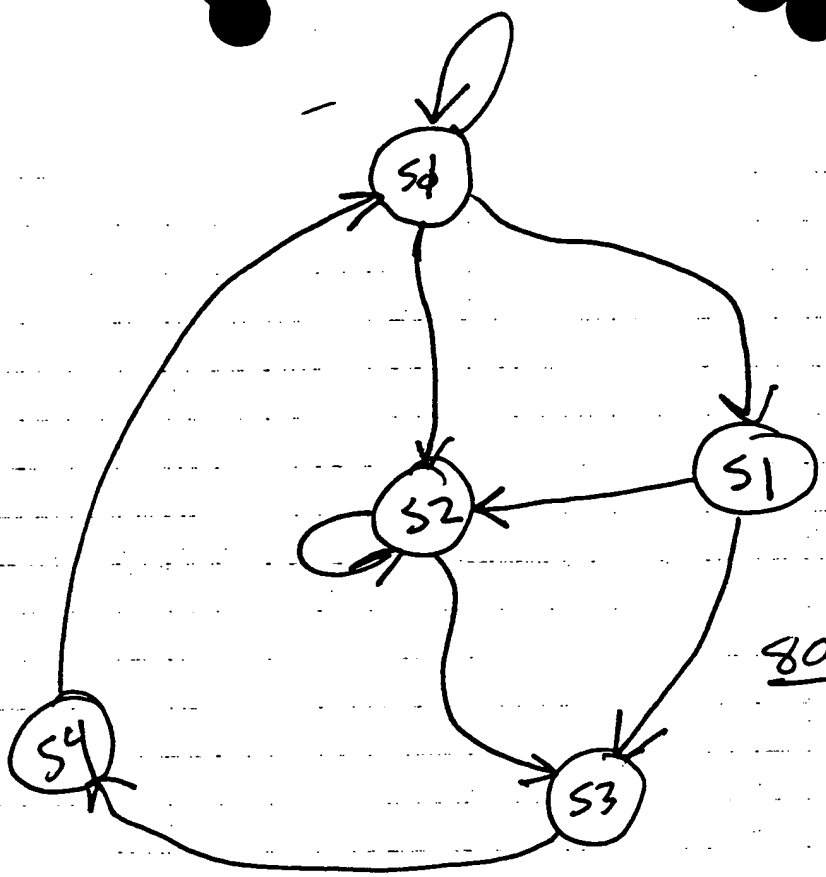


FIG. 8

(Prior Art)

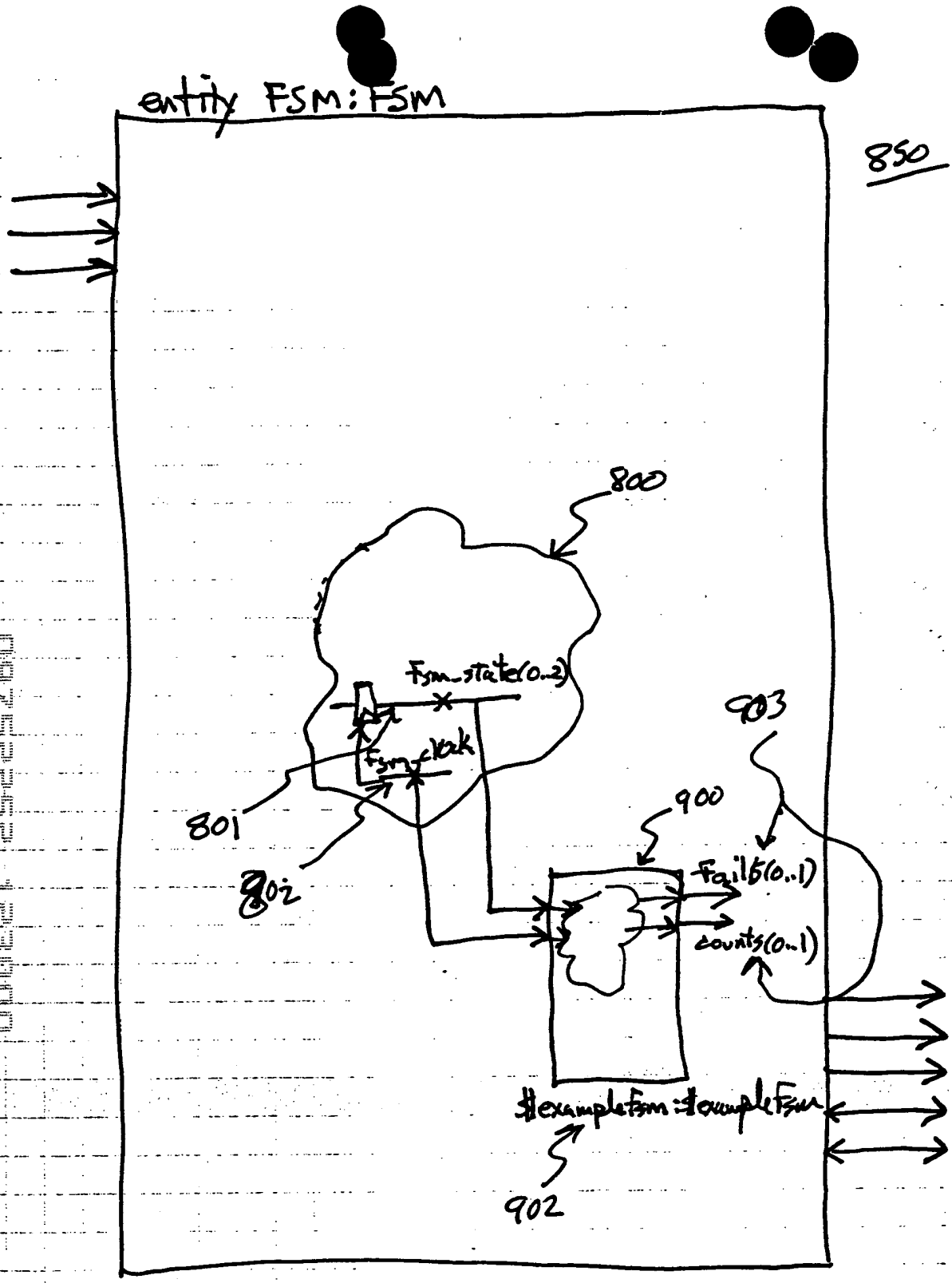

entity FSM: FSM
850
800
Fsm_state(0..2)
Fsm_clock
801
802
903
900
Failed(0..1)
counts(0..1)
#examplefsm: exampleFsm
902

FIG. 9

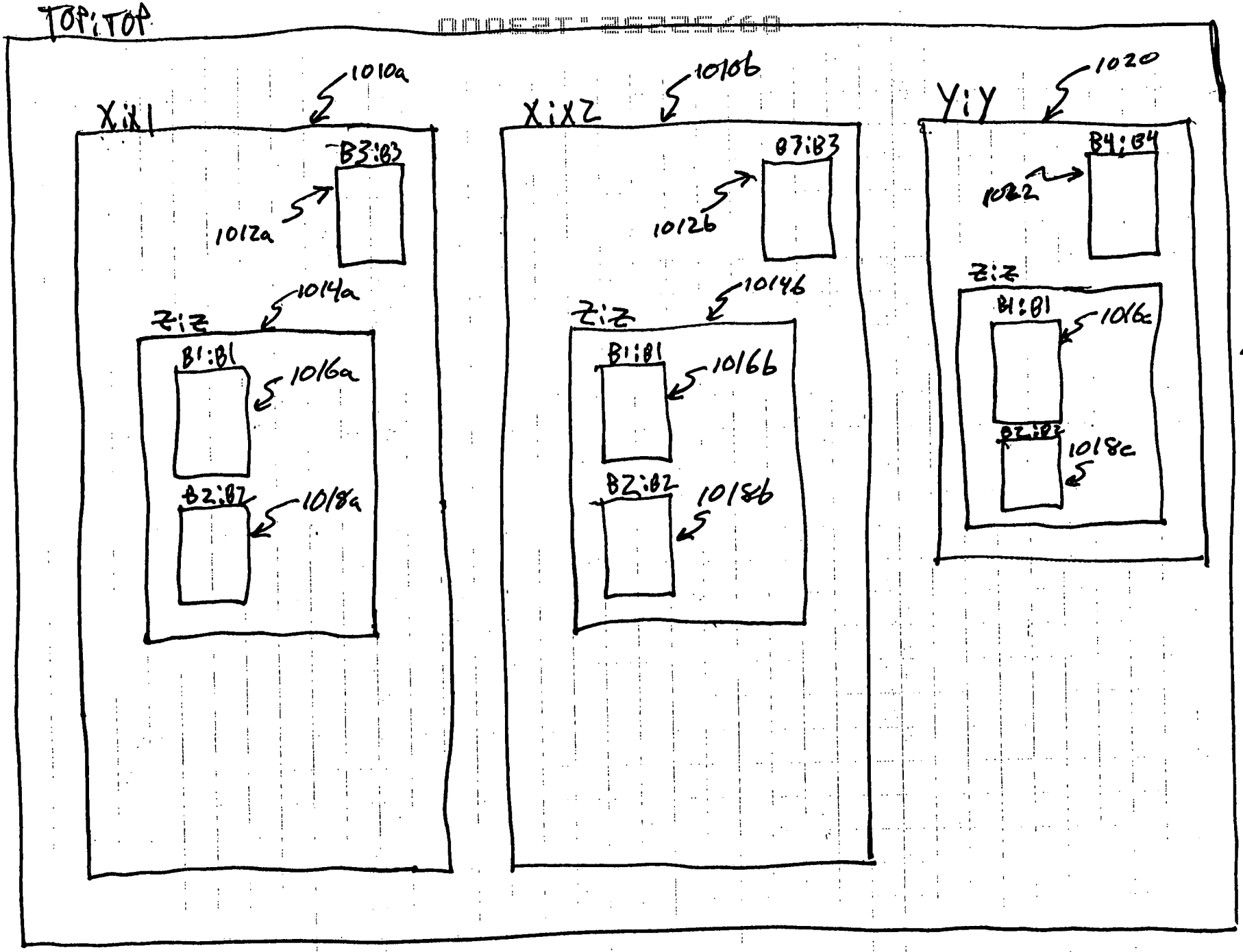

TOP:TOP
X:X1
1010a
B3:B3
1012a
Z:Z
1014a
B1:B1
1016a
B2:B2
1018a
X:X2
1010b
B7:B3
1012b
Z:Z
1014b
B1:B1
1016b
B2:B2
1018b
Y:Y
1020
B4:B4
1022
Z:Z
B1:B1
1016c
B2:B2
1018c

FIG. 10A

1030 1032 1034 1036

<instantiation identifier> . <instrumentation entity name> . <design entity name> . <eventname>

FIG 10B

1030	1032	1034	1036	
X1	B3	X	COUNT1	1040
X1.Z	B1	Z	COUNT1	1041
X1.Z	B2	Z	COUNT1	1042
X2	B3	X	COUNT1	1043
X2.Z	B1	Z	COUNT1	1044
X2.Z	B2	Z	COUNT1	1045
Y	B4	Y	COUNT1	1046
Y.Z	B1	Z	COUNT1	1047
Y.Z	B2	Z	COUNT1	1048

FIG 10C

1030 1034 1036

<instantiation identifier> . <design entity name> . <eventname>

FIG. 10D

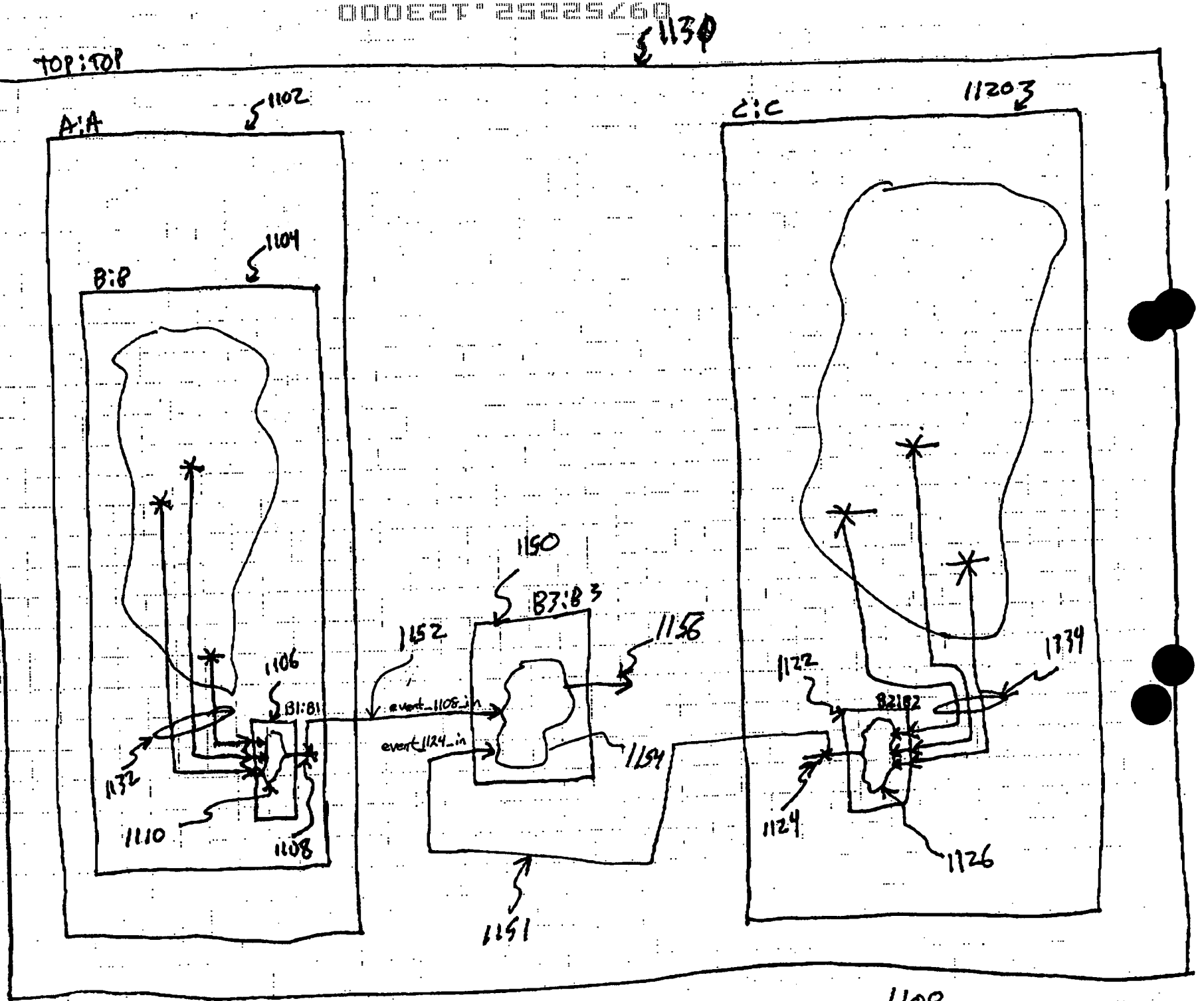


FIG. 11A

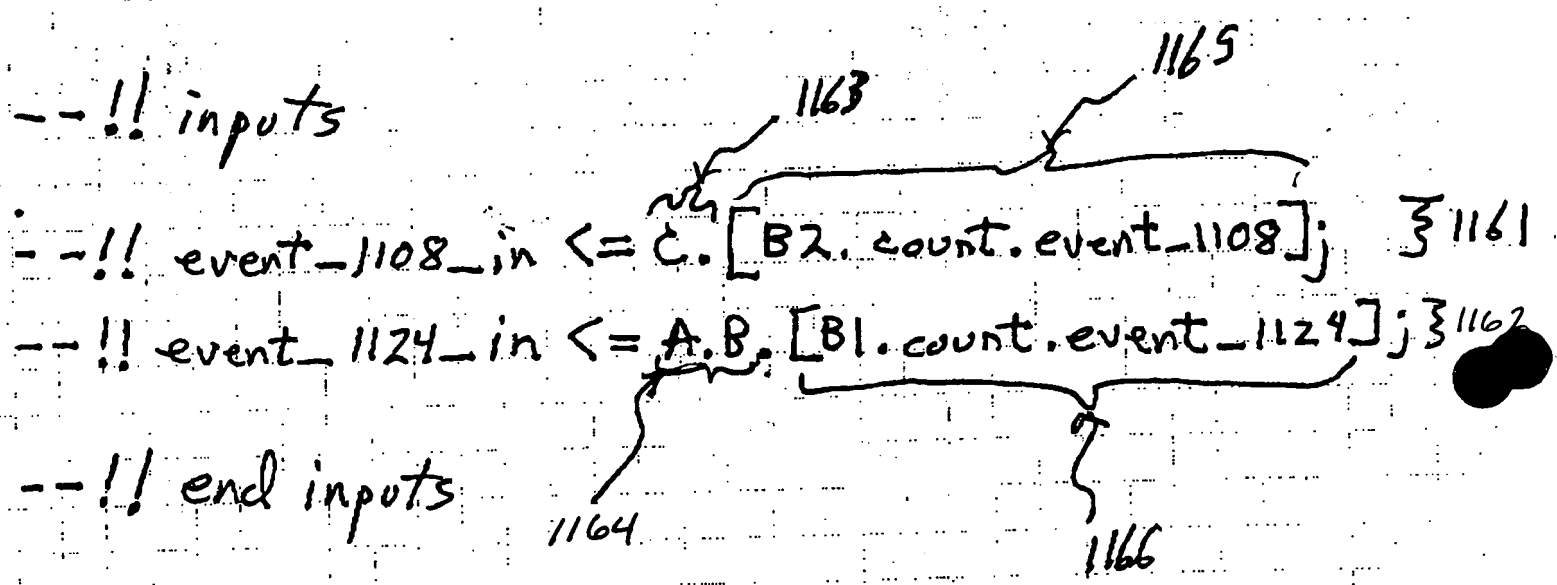


FIG. 11B

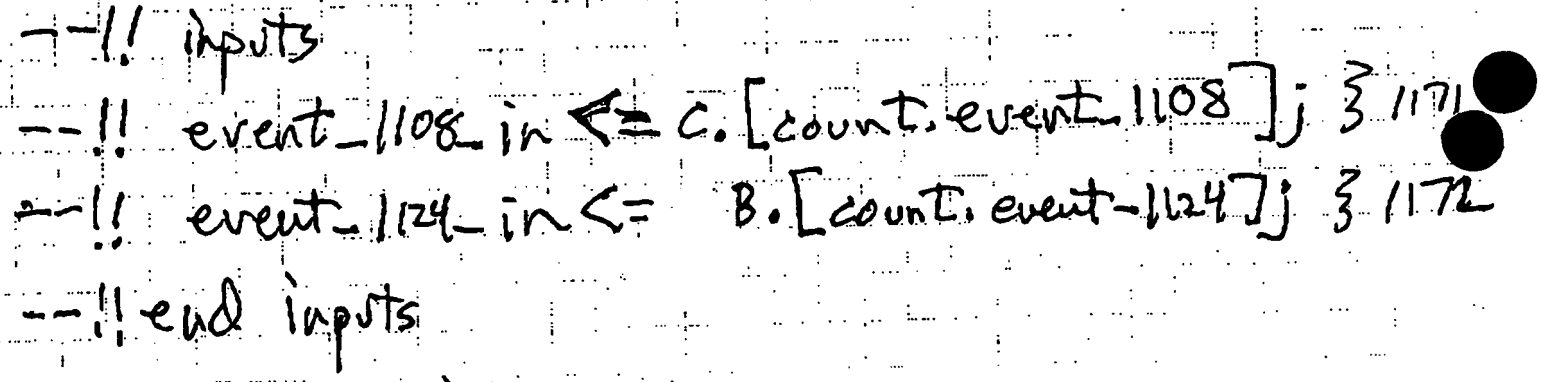


FIG. 11C

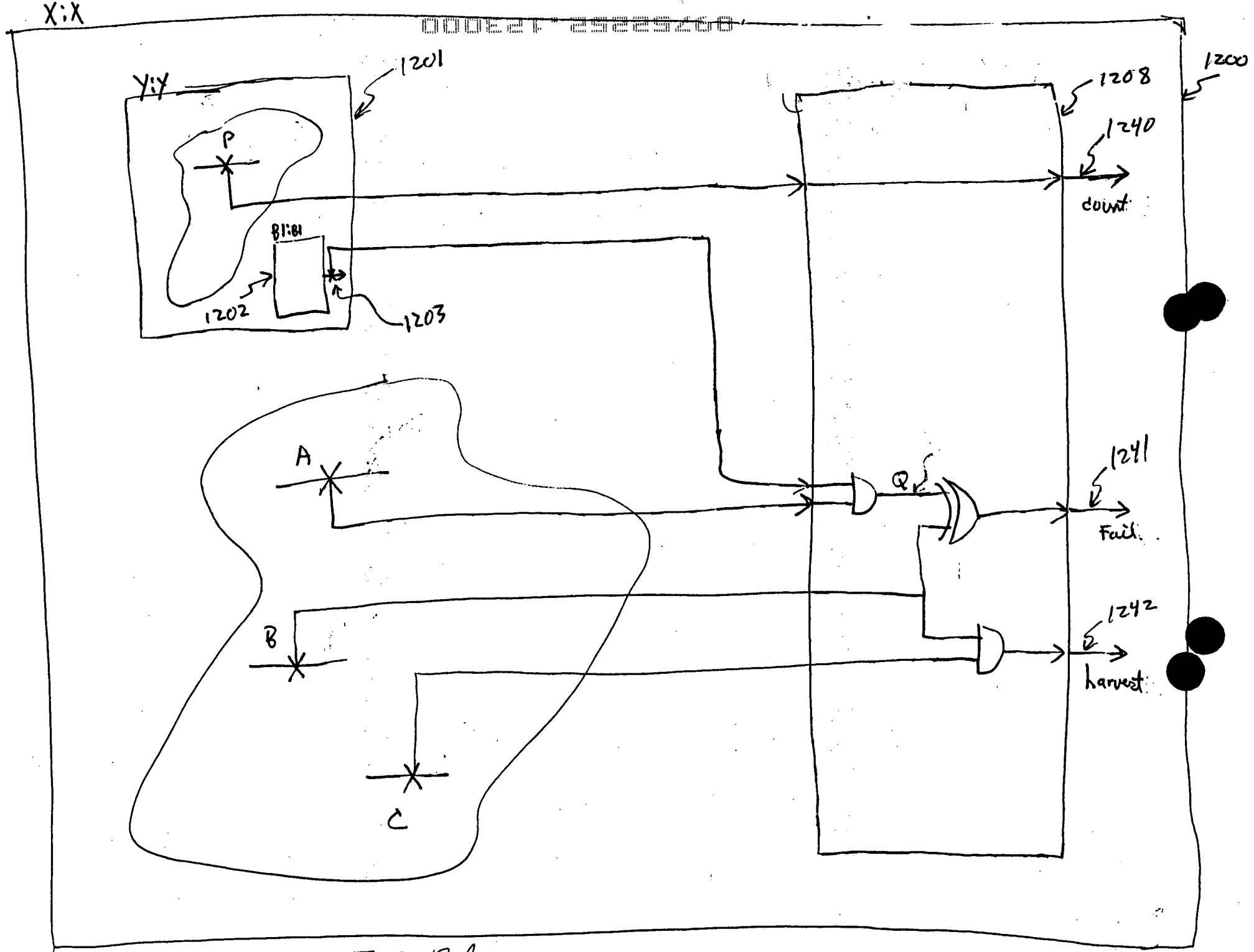

X:X
Y:Y
1201
P
B1:B1
1202
1203
1200
1208
1240
count
A
Q
1241
Fail
B
1242
harvest
C

FIG. 12A

```
Entity X IS
    PORT (
        ...
    );
ARCHITECTURE example OF X IS
BEGIN
    ...
    ...HDL CODE for X.....
    ...
    Y:Y
    PORT MAP(;                          } 1221
        );
    A <= ....
    B <= ....                           } 1222
    C <= ....
    --!! [count, countname0, clock] <= Y.P;      } 1230
    --!! Q <= Y.[B1.count .count+1] AND A;       } 1232
    --!! [fail, Failname0, "fail msg"] <= Q XOR B;   } 1234
    --!! [harvest, harvestname0, "harvest msg"] <= B AND C;  } 1236
                                        } 1223
    ...
END
```

FIG. 12B

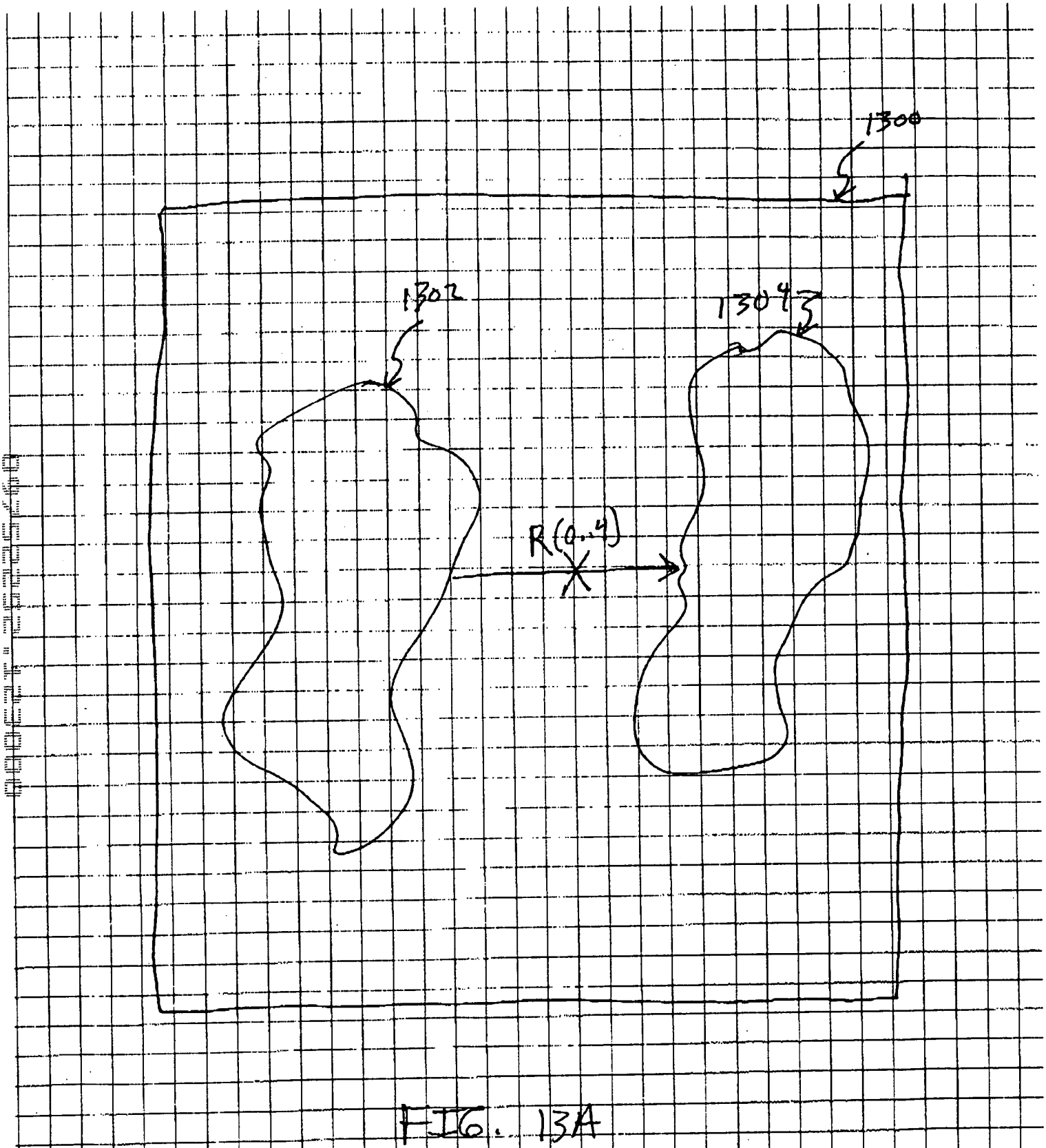


FIG. 13A

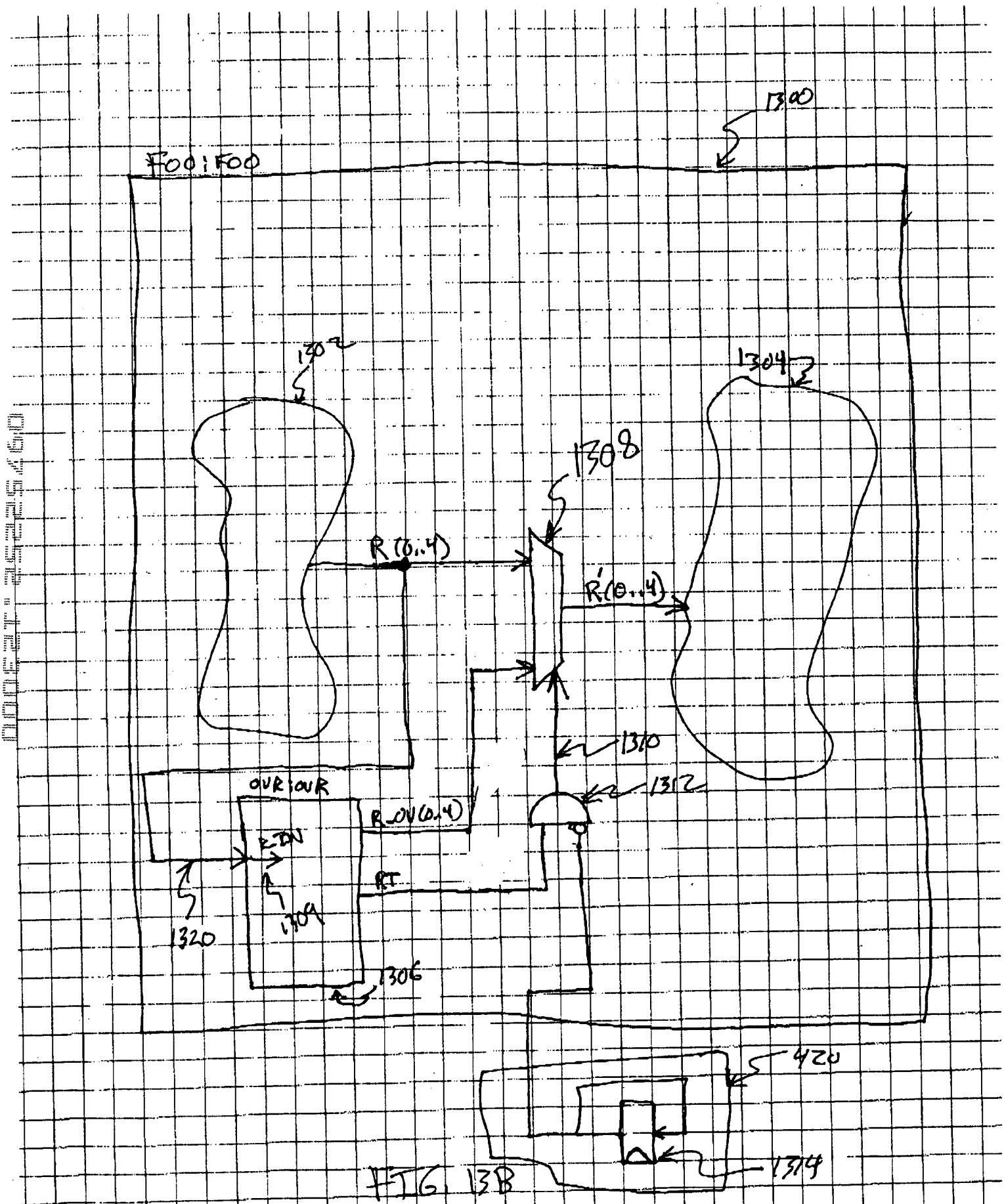

1300
F00:F00
1302
1304
1308
R(0..4)
R'(0..4)
1310
1312
OVR:OVR
R_OV(0..4)
R_IN
RT
1320
1306A
1306
420
1314

FIG. 13B

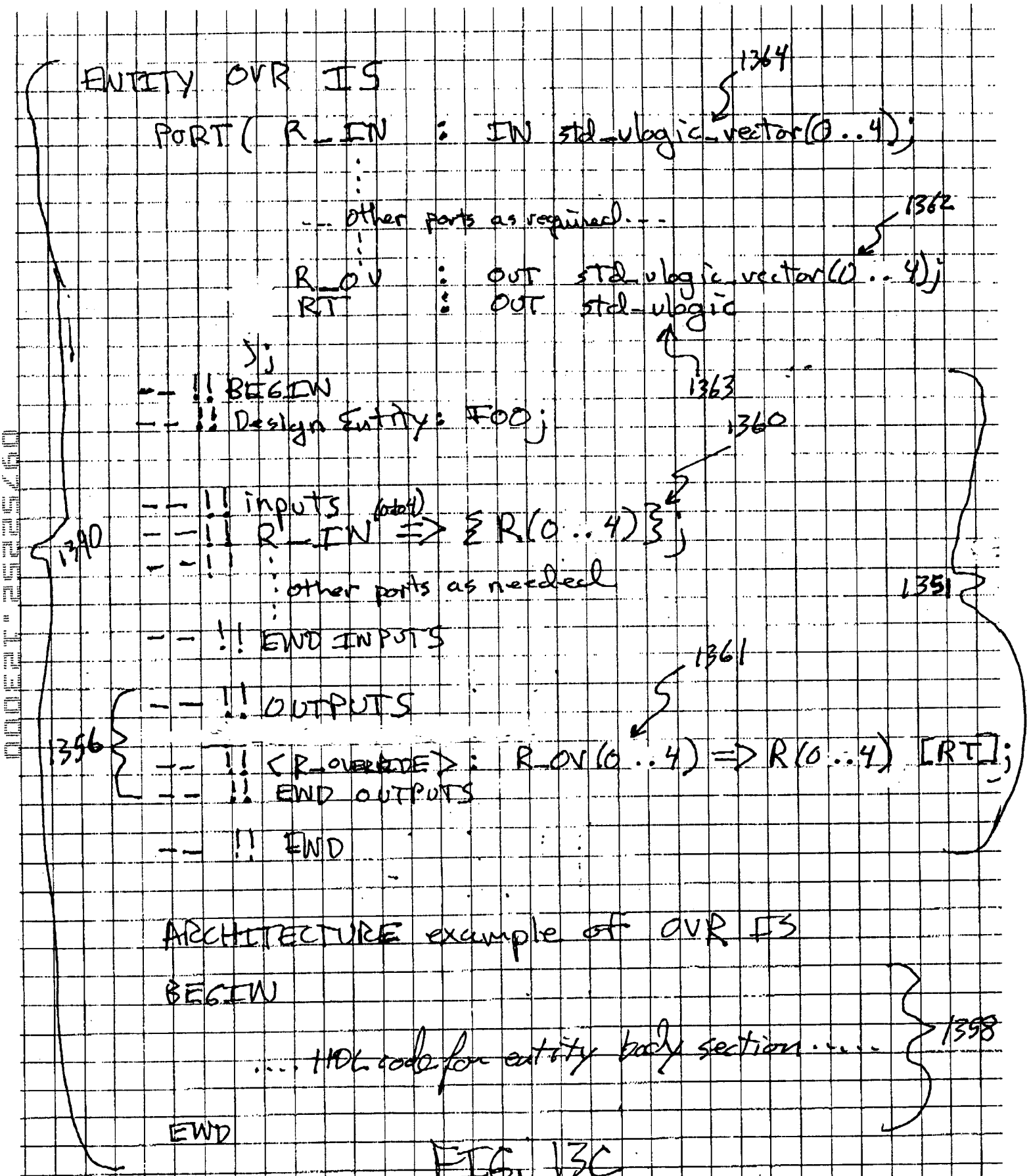
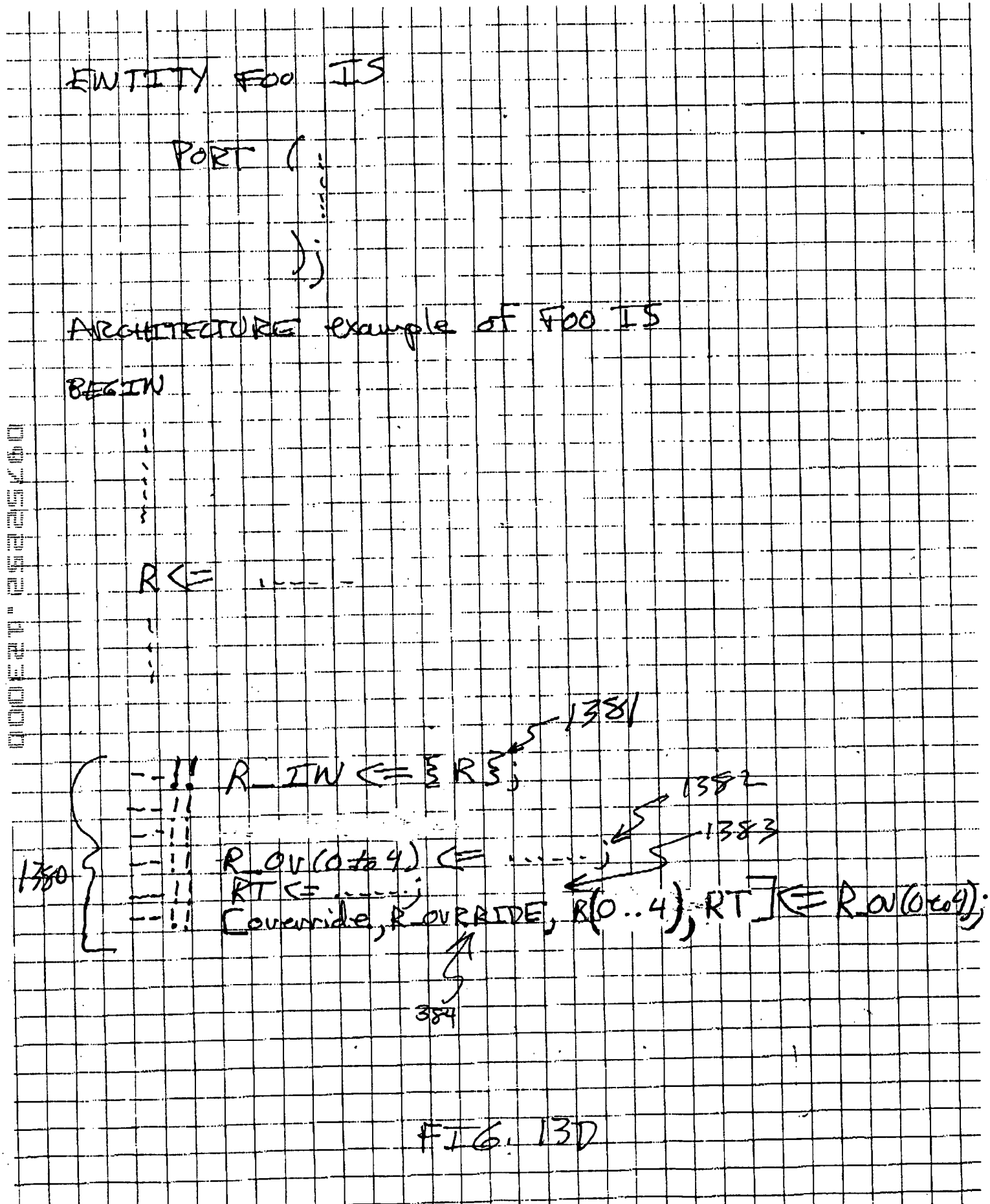

ENTITY OVR IS
PORT(R_IN : IN std_ulogic_vector(0..4);
... other ports as required ...
R_OV : OUT std_ulogic_vector(0..4);
RT : OUT std_ulogic
);
-- !! BEGIN
-- !! Design Entity: FOO;
-- !! inputs (total)
-- !! R_IN => {R(0..4)};
-- !! other ports as needed
-- !! END INPUTS
-- !! OUTPUTS
-- !! <R_OVERRIDE> : R_OV(0..4) => R(0..4) [RT];
-- !! END OUTPUTS
-- !! END
ARCHITECTURE example of OVR IS
BEGIN
... HDL code for entity body section ...
END
1364
1362
1363
1360
1350
1351
1361
1356
1358

FIG. 13C



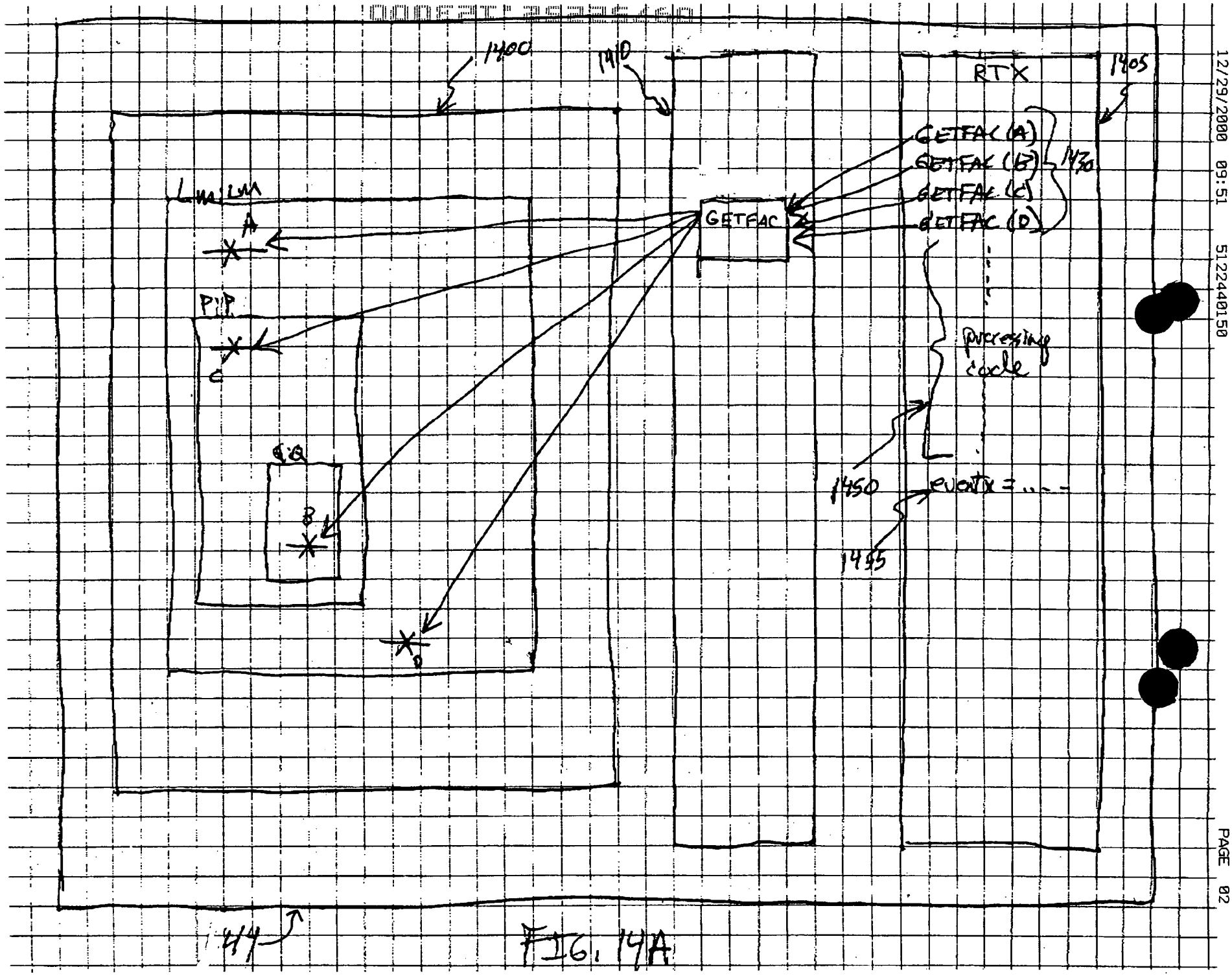


FIG. 14A

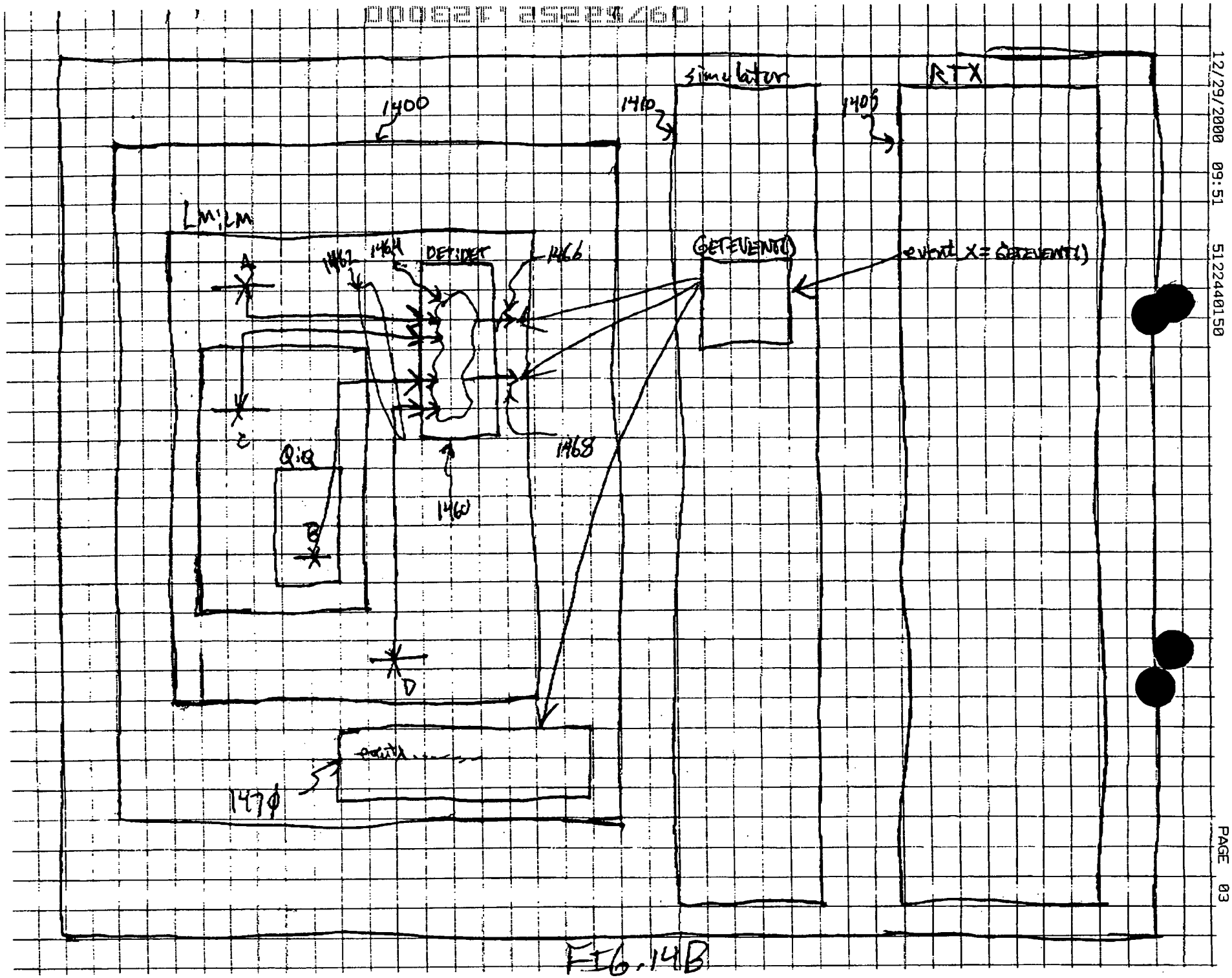


FIG. 14B

```
ENTITY DET IS
    PORT( A   : IN std_ulogic;
          B   : IN std_ulogic_vector(0 to 2);
          C   : IN std_ulogic;
          D   : IN std_ulogic;

          event_x : OUT std_ulogic_vector(0 to 2);
          x_here  : OUT std_ulogic;
        );

    -- !! BEGIN
    -- !! Design Entity : LWJ;

    -- !! INPUTS
    -- !!   A => A;
    -- !!   B => P.Q.B;
    -- !!   C => P.C;
    -- !!   D => D;
    -- !! END INPUTS

    -- !! DETECTIONS
    -- !! <event_x> : event_x(0 to 2) [x_here];
    -- !! END DETECTIONS

    -- !! END

ARCHITECTURE example OF DET IS

BEGIN

    .... HDL code ....

END;
```

1491 1492 1493 1494 1495 1480

FIG. 14C